

THE PENDING CLAIMS:

1. (Currently Amended) A method for monitoring an etch process, comprising:

(a) performing pre-etch critical dimension (CD) measurements of a substrate to generate pre-etch measurement information;

(b) applying an outlier filter to remove outliers in the pre-etch measurement information;

(c) analyzing the pre-etch measurement information to determine that a patterning is of a sufficient quality to allow for etching of the substrate and to determine process parameters to an etch process;

(d) providing the substrate along with the pre-etch measurement information to an etch reactor;

(e) etching the substrate in the etch reactor to form structures in the substrate using ~~an~~ the etch process, wherein the pre-etch measurement information in combination with etch process monitoring are used to in-situ monitor an etch process endpoint, wherein the etch process monitoring comprises:

directing radiation onto the substrate, wherein an intensity of the radiation is modulated at a frequency of about 10 Hz; and

collecting a portion of the radiation reflected from the substrate to determine critical dimension of the structures formed in the substrate; and

(f) terminating the etch process based on the etch process monitoring having identified that the etch process has reached the etch process endpoint.

2. (Cancelled)

3. (Previously Presented) The method of claim 1 wherein the etch process monitoring of step (f) further comprises achieving a pre-determined etch depth for the etch process.

4. (Previously Presented) The method of claim 1 wherein the etch process monitoring of step (f) further comprises achieving pre-determined feature dimensions for structures formed during the etch process.
5. (Cancelled)
6. (Previously Presented) The method of claim 1 wherein the pre-etch measurement information is obtained using optical metrology.
7. (Previously Presented) The method of claim 6 wherein the optical metrology comprises one or more techniques selected from the group consisting of interferometry, scatterometry, reflectometry and ellipsometry.
8. (Original) The method of claim 1 wherein the etch process monitoring is performed using optical metrology.
9. (Original) The method of claim 8 wherein the optical metrology comprises one or more techniques selected from the group consisting of interferometry, scatterometry and reflectometry.
10. (Original) The method of claim 1 wherein the etch process monitoring further comprises:
using a correlation between a vertical etch rate and a horizontal etch rate.
11. (Previously Presented) The method of claim 1 wherein the etch process monitoring further comprises:
using an interferometric measuring technique to measure a thickness of a layer.

12. (Original) The method of claim 11 wherein the radiation is directed substantially perpendicular to the substrate.

13. (Original) The method of claim 11 wherein the spectrum of the radiation directed onto the substrate comprises wavelengths in a range from about 200 to 800 nm.

14. (Cancelled)

15. (Previously Presented) The method of claim 1 wherein the etch process monitoring further comprises:

measuring an intensity of wavelengths in a spectrum of the radiation reflected from the substrate.

16. (Original) The method of claim 15 wherein the etch process monitoring further comprises:

using a correlation between a spectral position of a minimum in the spectrum and a width of structures formed on the substrate.

17. (Original) The method of claim 1 wherein the pre-etch measurements are provided by one of a metrology module coupled to a process system including the etch reactor and a metrology module removed from said process system.

18. (Currently Amended) A method for monitoring an endpoint of a mask trimming process, comprising:

(a) performing pre-etch critical dimension measurements of a substrate having a mask thereon to generate pre-etch critical dimension measurement information of such mask;

(b) applying an outlier filter to remove outliers in the pre-etch critical dimension measurement information;

(c) analyzing the pre-etch critical dimension measurement information to determine that the mask is of a sufficient quality to allow for etching of the substrate and to determine process parameters to an etch process;

(d) providing the substrate along with the pre-etch critical dimension measurement information to an etch reactor;

(e) trimming the mask using ~~an~~ the etch process, wherein the pre-etch critical dimension measurement information in combination with etch process monitoring are used to in-situ monitor the trimming the mask, wherein the etch process monitoring comprises:

directing radiation onto the substrate, wherein an intensity of the radiation is modulated at a frequency of about 10 Hz; and

collecting a portion of the radiation reflected from the substrate; and

(f) terminating the trim process when the etch process monitoring indicates that the mask has been trimmed to pre-determined dimensions.

19. (Cancelled)

20. (Original) The method of claim 18 wherein the mask is a photoresist patterned mask.

21. (Original) The method of claim 18 wherein the mask is trimmed using a plasma process.

22. (Cancelled)

23. (Previously Presented) The method of claim 18 wherein the pre-etch measurement information is obtained using optical metrology.

24. (Original) The method of claim 23 wherein the optical metrology comprises one or more techniques selected from the group consisting of interferometry, scatterometry, reflectometry and ellipsometry.
25. (Original) The method of claim 18 wherein the etch process monitoring is performed using optical metrology.
26. (Original) The method of claim 25 wherein the optical metrology comprises one or more techniques selected from the group consisting of interferometry, scatterometry and reflectometry.
27. (Original) The method of claim 18 wherein the etch process monitoring further comprises:
using a correlation between a vertical etch rate and a horizontal etch rate.
28. (Previously Presented) The method of claim 18 wherein the etch process monitoring further comprises:
using an interferometric measuring technique to measure a thickness of a layer.
29. (Original) The method of claim 28 wherein the radiation is directed substantially perpendicular to the substrate.
30. (Original) The method of claim 28 wherein a spectrum of the radiation directed onto the substrate comprises wavelengths in a range from about 200 to 800 nm.
31. (Cancelled)

32. (Previously Presented) The method of claim 18 wherein the etch process monitoring further comprises:

measuring an intensity of wavelengths in a spectrum of the radiation reflected from the substrate.

33. (Original) The method of claim 32 wherein the etch process monitoring further comprises:

using a correlation between a spectral position of a minimum in the spectrum and a width of the structures formed on the substrate.

34-49. (Cancelled)

50. (Currently Amended) A method for monitoring an endpoint of a mask trimming process, comprising:

(a) performing pre-etch measurements of a substrate having a patterned mask thereon to generate pre-etch measurement information of such mask, wherein the pre-etch measurements include width of structures comprising the patterned mask;

(b) applying an outlier filter to remove width outliers in the pre-etch measurement information;

(c) providing the substrate along with the filtered pre-etch measurement information to an etch reactor;

(d) determining process parameters of an etch process in response to the pre-etch measurement information;

~~(d)~~ (e) trimming the mask using ~~an~~ the etch process, wherein the filtered pre-etch measurement information in combination with etch process monitoring are used to in-situ monitor trim process, wherein the etch process monitoring comprises directing radiation having an intensity modulated at a frequency of about 10 Hz onto the substrate, collecting a portion of the radiation reflected from the substrate, measuring an intensity of wavelengths in a spectrum of the radiation reflected from the substrate, and using a correlation between a spectral position of a minimum in the spectrum and a width of the structures formed on the substrate; and

(e) (f) terminating the trim process when the etch process monitoring indicates that the mask has been trimmed to pre-determined dimensions.

51. (Previously Presented) The method of claim 50 wherein the mask is a photoresist patterned mask.

52. (Previously Presented) The method of claim 50 wherein the mask is trimmed using a plasma process.

53. (Previously Presented) The method of claim 50 wherein the pre-etch measurement information is obtained using optical metrology.

54. (Currently Amended) The method of claim ~~54~~ claim 53 wherein the optical metrology comprises one or more techniques selected from the group consisting of interferometry, scatterometry, reflectometry and ellipsometry.

55. (Previously Presented) The method of claim 50 wherein the etch process monitoring is performed using optical metrology.

56. (Previously Presented) The method of claim 56 wherein the optical metrology comprises one or more techniques selected from the group consisting of interferometry, scatterometry and reflectometry.

57. (Previously Presented) The method of claim 50 wherein the etch process monitoring further comprises:

using a correlation between a vertical etch rate and a horizontal etch rate.

58. (Previously Presented) The method of claim 50 wherein the radiation is directed substantially perpendicular to the substrate.

59. (Previously Presented) The method of claim 50 wherein a spectrum of the radiation directed onto the substrate comprises wavelengths in a range from about 200 to 800 nm.

60. (Cancelled)